



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
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WASHINGTON, DC 20350-2000

OPNAVINST 4442.3D
N4
31 Dec 2015

OPNAV INSTRUCTION 4442.3D

From: Chief of Naval Operations

Subj: GUIDELINES FOR COMPUTING SPARE AIRCRAFT ENGINE AND ENGINE
MODULE REQUIREMENTS

Ref: (a) DoD Instruction 4140.01 of 14 December 2011
(b) OPNAVINST 4614.1G
(c) Propulsion Management Board Charter of
16 Jul 2009 (NOTAL)
(d) OPNAVINST 13700.2A
(e) OPNAVINST 4442.5A

Encl: (1) Engine and Module Repair Process and Standards

1. Purpose

a. To implement policies and procedures governing the programming, budgeting and procurement of aircraft engines and modules, per reference (a).

b. This version incorporates the retail inventory management guidance provided in reference (a), commonly referred to as the "Super-Reg," and reference (b). This instruction is a complete revision and should be reviewed in its entirety.

2. Cancellation. OPNAVINST 4442.3C.

3. Scope. This instruction will be the definitive document in determining inventory procurement and retention quantities for Navy and Marine Corps aircraft engine or module stocking levels at all retail sites. The data points described in subparagraphs 3a through 3f will be used in determining each budget submission during the program objective memorandum process.

a. Material Management. Reference (a) prescribes procedures for the uniform management of Department of Defense (DoD) material. The DoD components must establish and pursue the goal of provisioning sufficient support items to meet end item readiness objectives at minimum investment cost.

b. Spare Engine and Module Requirements. Data elements needed to compute spare aircraft engine and module requirements within the repairable integrated model for aviation (RIMAIR) model will be obtained via separate correspondence. Use enclosure (1) engine and module repair process and standards as a guide to gather RIMAIR model information.

(1) Site Data. The aircraft planning data file must be used to obtain the number and distribution of operating aircraft and sites supported. The weapon system planning document must be used to obtain support sites and repair sites.

(2) Flight Hours. The current version of the budget analysis report (BAR) from the flying hour projection system (FHPS) will be used for all spare engine and module computations.

(3) Utilization Rate. Utilization rates will be 100 percent for all type, model, and/or series (T/M/S) engines and modules unless otherwise directed by Office of the Chief of Naval Operations (OPNAV), Air Warfare Directorate (N98).

(4) Protection Level. Spare engine and module requirements will be computed using a protection level in the RIMAIR model. This protection level provides a probability that the number of engines and modules programmed will be sufficient to meet projected demand. Protection levels for all aircraft will be set at 90 percent unless otherwise directed by OPNAV N98.

c. Repair Pipeline Standards

(1) Per references (c) and (d), Naval Air Systems Command (NAVAIRSYSCOM) will develop and submit to OPNAV N98 "in-work" times for all engines and modules. This data will be submitted to OPNAV N98 no later than 31 January each year.

(2) NAVAIRSYSCOM program managers (aviation) must use reference (e) to ensure inefficiencies within the logistics system are not captured within the sparing parameters, and ensure that additional sparing requirements are not computed to mask or compensate for these inefficiencies, i.e., transportation, awaiting parts, manpower, tooling, etc. Submission of OPNAV 4442/1 Input Parameters Worksheet must be

outlined in the OPNAV Logistics Programs and Corporate Operations Division (N41) spares baseline assessment memorandum (BAM) call letter issued prior to each BAM cycle.

d. Mean Engine Flight Hours Between Removal (MEFHBR). NAVAIRSYSCOM must develop MEFHBR projections which are to be updated annually and validated by the Propulsion Management Board chartered by reference (b). MEFHBR must be provided using reference (e) to incorporate information per subparagraphs 3d(1) and 3d(2).

(1) Newly Developed Engines. Engine maintenance plans will be used where available. Best engineering practice will be used when maintenance planning data is not available.

(2) Mature Engines. Historical data modified by anticipated major engineering change proposal incorporations will be used as appropriate.

e. Transportation Times. Transportation times are governed by reference (b), the uniform material movement and issue priority system (UMMIPS). Transportation times will be obtained using reference (a).

f. Modular Type Spare Engine Requirements. Engines are designed for disassembly into major sub-components that allow for rapid return of the whole engine to ready for issue (RFI) status. Although modular engines offer more rapid repair turnaround times (RTAT) than conventionally configured engines, aircraft operational availability requirements dictate that a level of built-up spare engines be maintained for immediate installation in aircraft in addition to spare engine modules. Spare engine and module requirements will be computed based upon the parameters outlined in this instruction. In work time for a given engine or module should reflect the advantages of the modular maintenance concept and thereby minimize the number of spare engines required.

4. Responsibilities

a. OPNAV N41 is responsible for approving models used for sparing computation and analysis.

b. OPNAV Fleet Readiness Division (N43) is responsible for providing flight hours from FHPS.

c. OPNAV N98 is responsible for providing guidance for the computation of aircraft engine and module requirements, to include the approval and validation of model OPNAV 4442/1, site data, utilization rates, and the protection level.

d. NAVAIRSYSCOM is responsible for providing repair pipeline in-work times and MEFHBRs. NAVAIRSYSCOM must obtain program guidance for computation of aircraft engine and module requirements from OPNAV N98 and will review all proposed input parameters with Commander, Naval Air Forces (COMNAVAIRFOR).

e. Naval Supply Systems Command, Weapon Systems Support (NAVSUP WSS), as NAVAIRSYSCOM's agent, is responsible for developing requirements and coordinating inputs provided by OPNAV and NAVAIRSYSCOM.

f. COMNAVAIRFOR is responsible to review all proposed input parameters for consistency with fleet goals.

g. As engine controlling custodians for engines and modules in active service, type commanders (TYCOM) are responsible to control assignment of RFI and not ready for issue (NRFI) engines and modules to subordinate engine reporting custodians. TYCOMs assign engine pool locations and determine pool allowance quantities to support planned operations. These allowances are a component of the overall spares quantity programmed for each T/M/S engine and module.

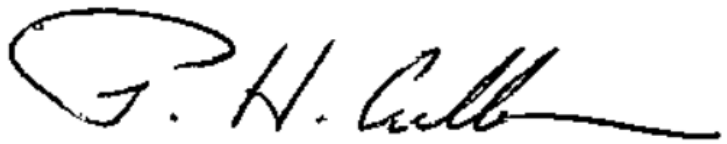
5. Documentation. Computations made to achieve all requirements will be calculated and displayed per reference (a). Updated recommendations must be provided to NAVSUP WSS and OPNAV N41 at a periodicity not to exceed 2 years.

6. Records Management. Records created as a result of this instruction, regardless of media and format, must be managed per Secretary of the Navy (SECNAV) Manual (M-)5210.1 of January 2012.

7. Forms and Information Management Control

a. OPNAV 4442/1 Input Parameters Worksheet is available for download from Naval Forms OnLine at <https://navalforms.documentservices.dla.mil/web/public/home>.

b. Reporting requirements contained within this instruction are exempt from reports control per SECNAV M-5214.1, subparagraph 7j, of December 2005.

A handwritten signature in black ink, appearing to read "P. H. Cullom". The signature is fluid and cursive, with a large initial "P" and a long horizontal stroke at the end.

P. H. CULLOM
Deputy Chief of Naval Operations
(Fleet Readiness and Logistics)

Distribution:

Electronic only, via Department of the Navy Issuances Web site
<http://doni.documentservices.dla.mil/>

ENGINE AND MODULE REPAIR PROCESS AND STANDARDS

1. Background. The information herein is a detailed description of the elements that make up the repair process and provides OPNAV standards to be used when computing spare engine and module requirements.

2. Definitions

a. Engines. Repairable assemblies, when installed in aircraft, are primarily responsible for driving the propulsion system (propeller or rotors) or providing the thrust necessary for the aircraft to fly. Engines are procured with aircraft procurement, Navy (APN)-6 funds and are considered end items.

b. Engine Modules. Major repairable subassemblies of aircraft engines that, when removed and replaced, can quickly return an engine to service. Engine modules differ from components in that they are procured with APN-6 funds and are considered end items.

c. Components. Repairable assemblies that cannot be repaired by intermediate or organizational-level activities. These assemblies are normally 7R cognizance material and managed by NAVSUP WSS.

d. Newly Developed Engines. The period in the engine life cycle prior to the stabilization of demand and re-supply rates. This period is also before the effects of significant engineering and support concept changes have been discovered and incorporated.

e. Mature Engines. The period in the engine life cycle in which demand and re-supply rates have stabilized and the effects of significant engineering and support concept changes are known and incorporated.

f. Aviation Readiness Requirements Oriented to Weapon Replaceable Assembly (ARROW) Model. The ARROW model is the OPNAV approved allowance computation model authorized for sparing computation and analysis for whole aircraft engines and modules.

g. Attrition. Engines and modules are considered to have zero wearout rate. All unserviceable spares will be assumed to be capable of repair or overhaul.

h. Organizational Level Maintenance (O-Level). Includes the removal and reinstallation of engines and propulsion systems in aircraft.

i. Intermediate Level (I-Level) Engine Repair. Involves the disassembly of engines, to include quick engine change kits (QECK), replacement of modules or components, and returning the engine to service.

j. I-level Module Repair. Involves the disassembly of engine modules, replacement of components and consumable parts to return the module back to RFI status so it can be installed in another engine.

k. Depot Level Maintenance (D-Level) Engine Repair. Involves the disassembly of engines, replacement of consumable parts to return the engine to RFI status. Generally does not include the replacement of modules and repairable components. If these items require repair, the depot further disassembles these components and their defective parts are replaced.

l. Depot Module Repair. Involves the disassembly of engine modules and replacement of consumable and repairable parts to return the module to RFI status.

3. Application to Specific T/M/S Engines

a. When modeling the repair process for a specific T/M/S engine, the maintenance concept may not match that depicted here, but generally the processes, procedures, and maintenance actions described here will be performed for every engine. These processes and actions may not take place at the same activities that are depicted here, but the processes that occur should still be considered either I-level or D-level, and the repair process modeled to include these activities regardless of the name of the activity performing the work.

b. For example, a commercial depot may perform both the functions of I-level repair and depot repair. If they utilize a pool of repairable components to repair engines and quickly

return them to service, then they have an I-level repair function. If they do both, then both I-level and depot repair are being performed, and spares should be computed with this in mind. If they do not have a pool of repairable components to support repair and they are required to repair or replace all of the parts of an engine or module before reassembling it, they they are considered strictly a depot repair activity.

c. In another case, if all engines are being repaired utilizing a pool of built up components, then the engine would be considered to be 100 percent I-level repair, and there would be no depot repair of the engine or module regardless if the work was done at a fleet I-level activity, a contractor's facility, or an organic depot.

4. Modular Engine Considerations

a. Engine and module requirements are computed separately. Engine requirements are computed for all sites that operate the aircraft and would perform maintenance. Engine requirements are computed based upon the authorized number of aircraft that are expected to operate at that site.

b. Module requirements will be computed for only those sites that would use engine modules to repair engines. Engine module requirements will be computed based upon the total number of aircraft supported by the site. That would include sites that do not have I-level repair, but forward their engines to the I-level site for repair. Examples are deployed detachments on ships that do not have engine repair capability; shore sites with no I-level capability; and shore sites where I-level capability is limited.

5. Engine and Module Removals

a. Engine and Module Removals. Engine removals will have a large impact on the number of spare engines and modules required to support the repair process and must be included for each engine and module removal by T/M/S.

b. Aircraft Flight Hours. The current version of the BAR from the FHPS must be used for all spare engine and module computations. The BAR expresses the aircraft flight hours for each T/M/S aircraft in terms of an average number of flight

hours flown per month. When computing spares requirements for aircraft programs that are increasing or decreasing in size, the budgeted monthly flight hours for each year can be used to calculate the spares requirements for each year. Mature programs can use a multi-year average to compute spares requirements.

c. Engine Flight Hours. Engine flight hours must be computed by multiplying the budgeted aircraft flight hours by the number of engines installed in the aircraft.

d. MEFHBR Goal. The MEFHBR is a measure of the number of times an engine has to be removed for repair because it has failed. The MEFHBR goal must be calculated and expressed in terms of engine flight hours. The MEFHBR goal should represent a reasonable estimate of the expected failure rate for the engine given the current status of the engine program and anticipated reliability improvements. For engine programs that are experiencing an increase or decrease in MEFHBR due to age, significant reliability improvement, or changes in maintenance concept, the MEFHBR used to compute engine and module spares requirements should be updated annually.

6. Engine Repair Process Modeling and Standards. Figure 1 depicts the elements of the engine repair process. It describes in detail the elements of the process and standards to be used when computing spare engine requirements.

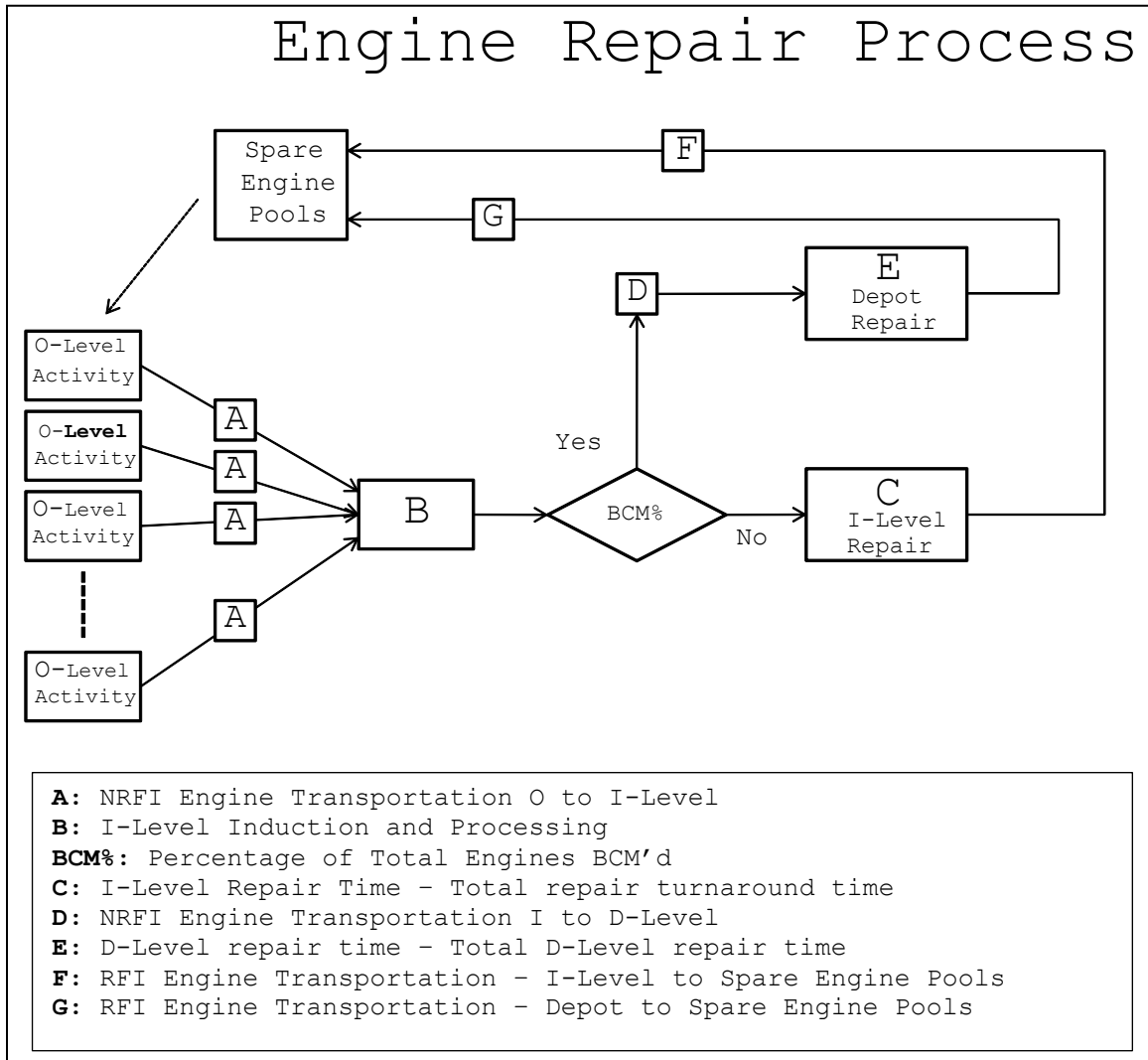


Figure 1

A. NRFI Engine Transportation O-Level to I-Level. Includes the removal, processing, packaging, and transportation time to I-level repair activity that normally supports that site. Transportation time standards include time required to ship an RFI replacement engine and are determined by reference (b).

B. NRFI Engine I-Level Processing. Includes the receipt, screening, and processing of an NRFI engine for induction for I-level repair, or beyond capability of maintenance (BCM) processing.

BCM%. Engine BCM Percentage. A percentage of engines that will be repaired at depot versus I-level. For modular engines and engines with robust I-level repair capability, this percentage should be small. The majority of engine repairs should be performed at the I-level unless build standards, cost effectiveness, or other considerations dictate that a higher percentage of engines return to the depot. Observed I-level and Depot repair rates, are adjusted to reflect changes in maintenance concept, repair capabilities, and build standards.

C. Engine I-Level RTAT. Includes the time required to remove and replace defective modules, components, and parts, testing, and processing time required to return the engine back to service. For those engines that require QECKs to make them RFI and ready for O-level installation, the amount of time required to remove and install the QECK is included in the I-Level RTAT. For modular engines, the engine I-level RTAT includes the amount of time required to remove and replace NRFI modules and components. The time required to repair the modules is accounted for in the module repair pipeline and it is assumed that RFI modules are available for installation on the engine. RTAT standards exclude awaiting induction, awaiting maintenance, and awaiting parts times.

D. NRFI Engine Transportation I-Level to Depot. Includes the transportation time from an I-level repair activity to the depot that normally supports that engine. Efforts should be made to minimize the number of times an engine is handled and shipped, therefore, unless an engine's maintenance concept dictates that all engines must be processed by an I-level prior to forwarding to a depot for repair, it is assumed that the I-level to depot transportation time is zero and the engine's transportation time to reach it's ultimate repair activity is accounted for in the O-level to I-level transportation time.

E. Engine Depot RTAT. Includes the time required to disassemble an engine, modules, and components as required, remove and replace defective parts, reassemble,

test, and return the engine back to service. For those engines that require QECKs to make them RFI and ready for O-level installation, the amount of time required to remove and install the QECK is included in the depot RTAT. Since removing modules or modular engines and replacing them with RFI ones is by definition I-level repair, the depot repair of modular engines includes disassembling the engine completely and replacing parts, regardless of whether it is contained in a module. RTAT standards exclude awaiting induction, awaiting maintenance, and awaiting parts time.

F and G. RFI Engine Transportation I-Level and Depot to Pools. The transportation time for an RFI engine from I-level or depot repair activity to a TYCOM designated spare engine pool site. This time is accounted for in the O-level to I-level transportation time.

7. Engine Module Repair Process Modeling and Standards. The elements of the engine module repair process are depicted in figure 2. It describes in detail the elements of the process and standards to be used when computing spare engine module requirements.

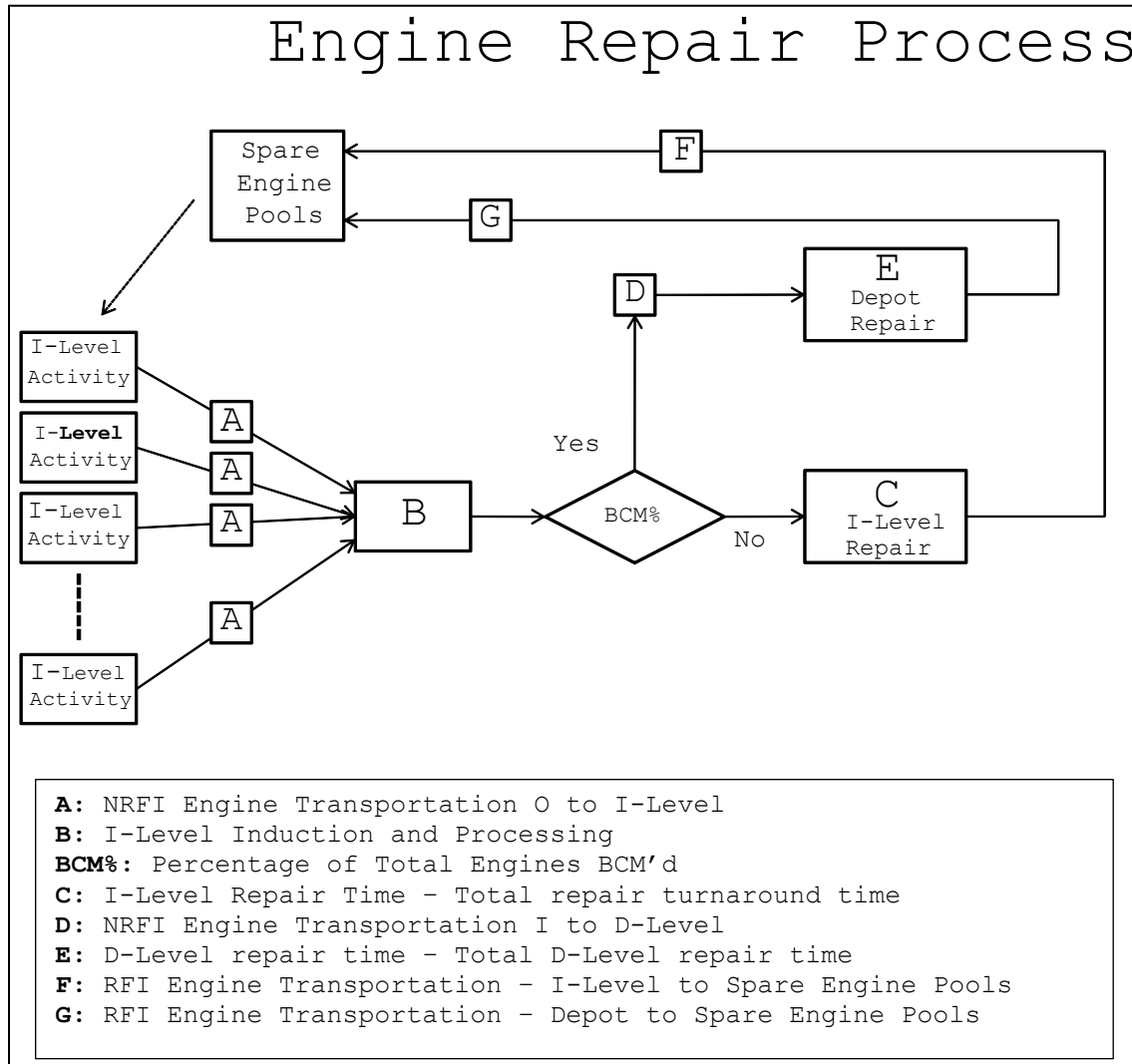


Figure 2

A. NRFI Module Transportation Third Degree I-Level to First Degree I-Level. Includes processing, packaging, and transportation time for a module from a third degree I-level activity to the first degree repair activity that normally supports that site. Transportation time standards include time required to ship an RFI replacement engine module. Removal time is accounted for in the RTAT of the engine.

B. NRFI Engine Module First Degree Prime I-Level Processing. Includes the receipt, screening, and processing of an NRFI engine module for the induction for first degree I-level repair, or BCM processing.

BCM%. Engine Module BCM Percentage. A percentage of engine modules that will be repaired at D-level versus first degree I-level. For modular engines with robust first degree I-level repair capability, this percentage should be small. The majority of engine module repairs should be performed at the first degree I-level unless build standards, cost effectiveness, or other considerations dictate that a higher percentage of engines return to the depot.

C. Engine Module First Degree I-Level RTAT. Includes the time required to remove and replace defective components and parts, testing, and processing time required to return the engine module back to service. It is assumed that RFI components and parts are readily available for installation on the module. RTAT standards exclude awaiting induction, awaiting maintenance, and awaiting parts time.

D. NRFI Engine Module Transportation First Degree I-Level to Depot. Includes the transportation time from a first degree I-level repair activity to the depot that normally supports that engine. Efforts should be made to minimize the number of times an engine module is handled and shipped, therefore, unless an engine's maintenance concept dictates that all engine modules must be processed by a first degree I-level prior to forwarding to a depot for repair, it is assumed that the first degree I-level to depot transportation time is zero and the engine's transportation time to reach the depot, its ultimate repair activity, is accounted for in the third degree I-level to first degree I-level transportation time (block 'A').

E. Engine Module Depot RTAT. Includes the time required to disassemble an engine module and components as required, remove and replace defective parts, reassemble, test, and make the module ready to reinstall in an engine. Since removing faulty components and replacing them with RFI components is by definition I-level repair, the depot repair of engine modules includes disassembling the module completely and replacing parts.

RTAT standards exclude awaiting induction, awaiting maintenance, and awaiting parts time.

F and G. RFI Engine Module Transportation I-Level and Depot to Pools. The transportation time for an RFI engine module from first degree I-level or depot repair activity to a TYCOM designated spare engine pool site. This time is accounted for in the third degree I-level to first degree I-level transportation time.